Reply to comments from Referee 1:

This interesting paper discusses the results of measurements of N_2O concentrations in the Changjiang River, fluxes from sediments and concentrations and derived fluxes from the water of the Changjiang estuary and adjacent sea. The paper is well written, well structured and reads easily. There are a few editorial suggestions listed below.
The results of the paper are really interesting. However, the paper could be even more interesting for a wider audience if the results are put in perspective.

Comment: Firstly, the estimated N_2O fluxes could be compared to the river DIN and total N load in the Changjiang. On page 3127 there is only data for sediment load. The river load of N_2O was estimated to be 15.0×10^6 mol/yr. This is only a small fraction of the N_2O in the estuary. I wonder how the authors conclude that the river input of N_2O is "significant".

Reply: The DIN fluxes and TN fluxes from the Changjiang (Li et al., 2007; Zhang et al., 2003) were added in the Introduction along with additional references. In the section of Air-sea fluxes, N_2O emission from the Changjiang Estuary was compared to river DIN and TN load, and found to account for about 0.17% of the total N load and 0.25% of the DIN load to the estuary via Changjiang. Although it was lower than the conversion ratio of 0.26% from TN estimated by Robinson et al. (1998) for Colne estuary and 0.3% from DIN input employed in the global scale models for estuaries (Seitzinger and Kroeze, 1998), the result is still reasonable considering the inner estuary and TMZ was not covered in this study. At the end of Section 3.2, N_2O input via Changjiang was compared with N_2O emission from the estuary and found to contribute about 7% to the latter, hence is only a minor source for dissolved N_2O in the Changjiang Estuary. It's unsuitable to use the word 'significant'. The text was revised accordingly.

Comment: The total N_2O flux from the estuary and adjacent marine area is more than 1000 g N_2O-N per year. Such high fluxes are comparable to fluxes from fertilized agricultural soils. My suggestion is that the authors make a comparison of fluxes and total emission from Chinese agricultural land (of agricultural land in the Changjiang river basin) and the estuary and adjacent sea area. I wonder how important the estuary is compared to agricultural land. Also, is there reason to modify the IPCC methodology for estimating N_2O emissions from nitrogen leached from agricultural soils, transported via runoff and through groundwater to surface water and estuaries.

At present the default estimate is 0.25% for N in groundwater, plus 0.25% for N in rivers, and 0.25% for N in estuaries. I wonder what % of N is eventually emitted as N_2O.

Reply: At the end of the Air-sea fluxes Section, N_2O fluxes from the Changjiang Estuary and its adjacent marine area (31.6 Gg N yr^{-1}) were compared with those from the paddy fields from the Changjiang basin (65 Gg N yr^{-1}, Xing, 1998). Although the former was lower than the latter, but they were of the same order of magnitude. Hence estuaries (i.e. the Changjiang Estuary), like agricultural land, can act as a significant source of atmospheric N_2O. The ratio of N_2O emission to DIN load in Changjiang estuary was estimated to be 0.25% in this study, which is lower than that (0.3%) employed in the global scale models by Seitzinger and Kroeze (1998), but is the same with that used by IPCC. Since N_2O fluxes may vary greatly in different estuarine systems, more observations at typical estuarine systems in the world should be done to understand the estuarine N_2O emissions on a global scale.

Detailed comments

Page 3127, line 28: is only inorganic N responsible for N_2O? Could not dissolved organic N and particulate (mainly suspended organic matter, and sediment) be involved in nitrification and denitrifcation process whereby N_2O is formed?

Reply: We agree with the reviewer on that DON and PN might also be a large source of N for N_2O production and the text was revised accordingly. However there are many published data about DIN in the Changjiang to show the long term variation while little data are available for DON and PN. Hence only data of DIN were shown as an example to show the historic trend of N load, and DON and PN fluxes during the period from 1998 to 1999 (Zhang et al., 2003) were also added in the introduction.

Page 3131: The discussion of the calculation of the sea to air flux of N_2O is confusing. Different terms are used (transfer velocity, transfer coefficient, see also page 3136, line 21-22) which may or may not be the same. Other terms (Sc, k_{600}, U_{10}) need explanation, because most readers will not know.

Reply: Transfer velocity (k) was used throughout the text and the terms of Sc, k_{600} and U_{10} were defined in the text.

Figure 2 and page 3132: The relationship between DIN and N_2O concentrations is counterintuitive. One would expect that when DIN is lost through denitrification, N_2O is high, so an inverse relationship. Could the authors add a brief explanation?

Reply: Concentrations and emissions of N_2O in estuaries are generally found to be related to the estuarine dissolved inorganic nitrogen (DIN) levels (Seitzinger and Kroeze, 1998; Dong *et al.*, 2004). N_2O can be produced via both nitrification and denitrification in rivers and estuaries, which was related to external inputs of nitrogen to these systems. As shown in the N model by Seitzinger and Kroeze (1998), N_2O emissions are nonlinearly related to the DIN export, with higher emissions for higher N levels at aquatic systems, which is consistent with our results.

Editorial suggestions:

Page 3128, line 4: change dessicated to aerobic.

Page 3128, line 6: Here we present.

Page 3128, line 7: The objectves of ous study

Page 3129, line 26: Microbial acitivity in filtrates was inhibited by $HgCl_2$ and then stored.

Page 3130, line 2: using the closed chamber technique.

Page 3130: what are bungs and bangs?

Page 3131, line 12: added instead of purposeful.

Page 3132, line 17: may be partly due to the fact that most

Page 3135, line 10: change easily into high.

Page 3136, line 7: change “In any way” into “In summary”.

Page 3137, line 10: change “should be relatively” into “are probably”.

Reply: The text has been reworded as recommended.

Comment: Page 3136, line 18: what is the unit of the salinity?

Reply: In 1978, oceanographers redefined salinity as the conductivity ratio of seawater to a standard KCl solution. This ratio has no unit, hence salinity was usually expressed as a dimensionless number.